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# A multichannel typology of temporary employment careers in the Netherlands: Identifying traps and stepping stones in terms of employment and income security



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## ABSTRACT

In this paper, we apply multichannel sequence analysis of labour market positions and incomes to create a typology of careers starting with temporary employment in the Netherlands. For this purpose, we use detailed register data from Statistics Netherlands for all workers who entered temporary employment in 2007 and were observed for 96 months. This approach leads to a typology of 17 different career types that shows a considerably larger variation - in terms of employment and income security - than previous research has shown. Specifically, the typology shows that 29.6% of the research population has a stepping stone career with high career and income security, while 39.7% has a dead-end career with low career and income security. However, a large part of careers – 24.7% – cannot be classified in this traditional distinction, as they combine high employment security and low incomes or high incomes and low employment security.

## 1. Introduction

Temporary employment is a widely discussed topic both in research and policy. In the Netherlands, the share of temporary employment has considerably increased during the last 20 years: while in 2003 14% of the working population was employed in a temporary contract, this percentage increased to 22.7% in 2017 (CBS Statline, 2018a). In contrast to other European countries, this increase has persisted even after the peak of the recent economic crisis (Eurostat, 2018b; Euwals et al., 2016).

A large body of research has examined the causes and the consequences of the rise in temporary employment. This form of employment presents advantages for employers as it offers them flexibility in adapting their workforce. In contrast, for workers, jobs with temporary contracts are in general considered to be inferior (de Beer, 2016; Vermeulen et al., 2016). Specifically, workers in such jobs, on average, earn lower wages, enjoy less job security, have fewer promotion possibilities and receive less fringe benefits and training (Booth et al., 2002; Giesecke and Groß, 2003; OECD, 2014). For this reason, temporary employment is seen as a source of rising social inequality (Gash and McGinnity, 2007), while, in the context of labour market segmentation theory, the permanency of the contract is core in distinguishing between the primary and the secondary segment of the labour market (Fuller and Stecyk-Hildebrandt, 2015; Gash, 2008; Kalleberg, 2001; Scherer, 2004).

Research is inconclusive about the role of temporary employment in the employment career. Some find that temporary jobs function as a stepping stone towards permanent employment (de Graaf-Zijl, van den Berg and Heyma, 2011; de Lange et al., 2013), whereas others suggest that temporary employment hinders career progress as individuals get trapped in a vicious circle of insecure

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jobs and non-employment (Leschke, 2009; McGinnity et al., 2005). We argue that four characteristics of previous research may be responsible for this inconclusiveness. First, most studies typically focus on transitions from a specific type of temporary employment – typically fixed-term contracts – and in this way fail to account for differences between the various types of temporary employment contracts. Second, research focuses almost exclusively on specific point-in-time transitions – usually the transition to permanent employment –, ignoring the timing, order and duration of all other employment and non-employment spells that individuals experience in their careers. Third, employment with a permanent contract is strictly considered as the only ‘optimal’ outcome of a career path. Fourth, studies typically investigate the quality of the employment career by looking at a single aspect of it – typically the type of contract or income (see for example, D’Addio and Rosholm, 2005; Remery et al., 2002; Steijn et al., 2006), while we know that the quality of the employment career is better assessed by studying these aspects simultaneously (Tilly and Tilly, 1998).

This paper uses a holistic approach to investigate temporary employment. Specifically, building on the seminal work of Fuller and Stecy-Hildebrandt (2015), we apply multichannel sequence analysis (Gabadinho et al., 2011; Gauthier et al., 2010) to simultaneously study employment and income trajectories of individuals who enter temporary employment. Employment trajectories are created by taking into account spells of several types of temporary employment, i.e. fixed-term contracts, on-call contracts and temporary work agency contracts, as well as spells of self-employment and non-employment. In this way, two aspects of job quality, i.e. employment and income, are combined to produce a typology of temporary employment careers. This allows us to further classify the clusters of temporary employment trajectories according to the employment and income security they offer to workers. This classification is much more detailed than previous research as the type, the timing, the duration and the order of all employment spells and the incomes of individuals are taken into account in the creation of the typology. This paper also delivers a modest methodological contribution to sequence analysis. Specifically, within our multichannel sequence analysis, we propose a replication strategy that ensures the reliability of typologies when dealing with large-scale, heterogeneous data.

This paper is organized as follows: section 2 discusses the theoretical approaches on the role of temporary employment in the life course. Section 3 presents the methodology of multichannel sequence analysis, the data that we use and the proposed replication strategy. Section 4 presents the typology of temporary employment careers and section 5 the conclusions of this research.

## 2. Temporary employment as a stepping stone or a trap

Temporary employment falls under the broad concept of labour market flexibility. Labour market flexibility refers to a wide array of contracts and work arrangements that deviates from employment with a permanent contract that entails an 8-hour working day. Research on labour market flexibility distinguishes between numerical and functional flexibility (Atkinson, 1984; Hunter et al., 1993; Kalleberg, 2001; Smith, 1997). *Numerical flexibility* refers to the types of flexibility that are based on changes in the size of the workforce of the firm. *Functional flexibility* refers to the extent that workers can change tasks and activities within the firm. Within numerical flexibility, research distinguishes further between external and internal flexibility. *External numerical flexibility* refers to the adjustment of the number of workers employed by the firm using resources from the external labour market. Forms of temporary employment, such as fixed-term contracts or hiring workers via a temporary work agency, fall in this category of flexibility. *Internal numerical flexibility* refers to the adjustment of working hours within the firm without turning to the external labour market. Part-time employment as well as some forms of temporary employment, such as on-call work are examples of this type of flexibility. Studying the quality of employment careers universally would have to take into account all the aforementioned types of labour market flexibility, together with income and job satisfaction. These three aspects are identified in the literature as the core aspects of job and career quality (Kalleberg, 2011).

The Netherlands are a particular case when it comes to labour market flexibility, as various forms of numerical flexibility are much more common in the Dutch labour market compared to other European countries. The Netherlands have experienced a large and persisting increase of fixed-term employment in the last two decades: 19.3% of employees now work on a fixed-term contract, while the EU average is only 13.3% (Eurostat, 2018c). This increase is due to the relatively strong employment protection of permanent contracts while the protection of fixed-term contracts is relatively low, which makes using fixed-term contracts attractive for employers (OECD, 2013). The shares of temporary work agency contracts and on-call jobs have increased in this period as well, with the share of on-call jobs doubling to 6.3% in 2017 (CBS Statline, 2018c).

Furthermore, the Netherlands are well-known for their high share of part-time employment: 46.6% of the working population and 74.1% of working women work part-time in the Netherlands, while the EU averages are only 18.7% and 31.1% respectively (Eurostat, 2018b). However, in the Netherlands, part-time work can be hardly considered as a form of employment that may have negative consequences for the career of the individual. Working part-time is mostly a voluntary choice of the employees, for instance to facilitate workers in combining work and care tasks (Portegijs and Keuzenkamp, 2008). Furthermore, Dutch employment legislation allows workers to adapt the number of their working hours (Hevenstone, 2010). For this reason, the Netherlands have one of the lowest shares of involuntary part-time employment in Europe (Eurostat, 2018a): in 2017 only 16.9% of part-time employees indicated they would prefer to work more hours (CBS Statline, 2018b).

In this paper, we focus on the most common types of temporary employment in the Netherlands. These include fixed-term contracts and temporary work agency jobs, that are forms of external numerical flexibility, as well as on-call jobs, which are a form of internal numerical flexibility (de Beer et al., 2011). Seen from the broad perspective of labour market flexibility, the latter two forms of employment create insecurity for the worker that extends beyond the duration of the employment contract. Specifically, on-call work is associated with insecurity in working hours and therefore also in income, while temporary agency work is related to insecurity with some employment and income insecurity, but also with the workplace where temporary agency workers are employed. Therefore, although in some cases on-call jobs and temporary work agency jobs may be permanent, the negative aspects that are

related to these contracts persist.<sup>1</sup>

In research on the role of temporary employment in the employment career, there are two opposing scenarios. More specifically, the typical aim of this research is to determine whether temporary employment functions as a *stepping stone* – a portal to permanent employment – or as a *dead end or trap* – a job that leads to repeated temporary jobs alternated with unemployment. The stepping stone scenario is based on human capital theory (Mincer, 1974), which suggests that by working in temporary employment instead of remaining unemployed, workers acquire skills and experience which subsequently improve their career prospects, in terms of both income and contract type (de Graaf-Zijl et al., 2011). Signalling theory, which incorporates imperfect information into human capital theory (Becker, 1993; Spence, 1973), supports the stepping stone scenario. This theory suggests that employers possess imperfect information on the productivity of new hires and use temporary jobs as a screening device during the probation period (Weiss, 1995). If the worker meets the employer's expectations, the employer offers the worker a permanent contract (Booth et al., 2002; Faccini, 2014; McGinnity et al., 2005; Reichelt, 2015).

Those who argue that temporary jobs are dead ends use arguments from dual labour market theory (Doeringer and Piore, 1971) and argue that these contracts are used by employers mainly to adapt their workforce to economic fluctuations. With temporary employment contracts, employers can hire workers easily in an economic upturn, and lay them off at low transaction costs when product demand decreases (Kalleberg, 2003). As employers hire workers for a short period of time, they have fewer incentives to invest in workers' human capital. Therefore, an employment history that includes several spells of temporary employment can function as a signal of lower productivity for future employers, making them less likely to offer the worker a permanent contract (Berton et al., 2011; Esteban-Pretel et al., 2011; Hopp et al., 2016; Hudson, 2007).

Many empirical studies have investigated the labour market outcomes of temporary employment. However, this research has not reached a uniform outcome: some studies find that temporary jobs function as stepping stones, whereas others conclude that they lead to traps of repeated temporary jobs and unemployment spells. Several factors explain this inconclusiveness. Firstly, many studies disregard the variation in types of temporary employment contracts. Many lump all different types of temporary employment together (D'Addio and Rosholm, 2005; de Graaf-Zijl et al., 2011; Esteban-Pretel et al., 2011; McGinnity et al., 2005; Remery et al., 2002; Steijn et al., 2006). Others focus only on one specific type of temporary employment, typically fixed-term contracts (Autor and Houseman, 2010; Hopp et al., 2016; Ichino et al., 2008; Pavlopoulos, 2013), while in some cases the type of temporary employment that is studied is not clearly defined (Faccini, 2014; Giesecke and Groß, 2003; Picchio, 2008; Wolbers, 2010). If any variation in the types of temporary employment is allowed, this is mostly limited to the distinction between fixed-term contracts and seasonal/casual work, which are then studied separately (Addison et al., 2015; Booth et al., 2002; de Lange et al., 2013; Leschke, 2009). A notable exception is the study by Berton et al. (2011) in which the interplay of the effects of five types of temporary employment is studied.

Research shows that Dutch employers use different types of temporary employment for different reasons (van Echtelt et al., 2015). In more detail, employers for instance tend to use fixed-term contracts either as a probation period for their new hires or because they are uncertain about future product demand. The first aim may cause a stepping stone effect, as a successful probation period would lead to permanent employment. The second aim can have varying outcomes, depending on the economic context: in an economic upturn, the fixed-term contract may be converted to a permanent contract as future demand is quite secure, but in an economic downturn the contract is less likely to be followed by a permanent job. Temporary work agency workers and on-call workers are mostly used by employers to get more flexibility to adapt their workforce to short-term or frequent fluctuations in demand. On-call workers are furthermore used to replace sick or absent workers. In such types of jobs, it is less likely that a contract is converted into a permanent contract (Berglund et al., 2017). As the possible outcomes of temporary employment turn out to depend strongly on the type of temporary employment, the fact that this variation has not been included in previous research may have contributed to the inconclusiveness of the results.

Secondly, previous research typically studies point-in-time transitions and focuses on the duration until a transition to permanent employment takes place. This means that there is little attention for what happens *until* that specific transition occurs, and for what happens *after* this transition is made. This introduces a twofold problem. First, as temporary employment may have a scarring effect, the career path of a worker is likely to influence a worker's probability to make the transition to a good labour market outcome as well as the duration until that transition takes place (Hopp et al., 2016; Mooi-Reci and Dekker, 2015; Pavlopoulos, 2013; Scherer, 2004). Second, a transition to permanent employment does not have to be a final outcome in the worker's career. Especially in times of crisis, jobs with permanent contracts may be terminated as well. Furthermore, some workers may be willing to trade job security for a higher income or more working hour flexibility and opt for moving from a standard to a temporary job (van der Klein et al., 2016).

A third issue is that employment with a permanent contract is regarded as the only 'good' outcome of a career. However, given the variety in temporary employment, not all temporary jobs have to be an inferior labour market outcome *per se*: some workers in temporary jobs may earn sufficiently high wages that compensate for the job insecurity that accompanies temporary employment. The opposite reasoning is also valid: some workers may make the transition to a permanent job, but still not earn a decent living wage, resulting in in-work poverty (Thiede et al., 2015). In this case, income insecurity detracts from employment security. By considering employment with a permanent contract as the only good outcome without looking at the incomes of both permanent and temporary jobs, the image of temporary employment outcomes probably becomes distorted.

The fourth and final issue refers to the fact that the distinction between successful and precarious careers focuses typically on one

<sup>1</sup> We estimate that around 20% of the records indicating on-call work involves a permanent contract, while only 3.5% of the records indicating temporary agency work involves a permanent contract. Unfortunately, no official statistics exist on this subject.

aspect of job quality, either labour market positions or income. Research suggests that job quality can be effectively assessed by three factors: labour market position, income and job satisfaction (Kalleberg, 2011; Tilly and Tilly, 1998).

Some of the aforementioned issues of previous research have been dealt with in the seminal study of Fuller and Stecy-Hildebrandt (2015) on Canadian workers. By using sequence analysis on labour market position and by distinguishing between fixed-term contracts and part-time employment, they adopt a holistic approach on employment careers which delivers a clear image of the variation of temporary employment careers in the Canadian labour market. They show that a large share of workers is unable to remain in jobs with permanent contracts and return to temporary employment. However, although they investigate income growth in different career types, income is not included in the construction of their typology of employment careers. Thus, there might still be quite some variation within the career types in terms of income, and consequently also in terms of precarity. Despite this, their work has clearly illustrated that using a holistic approach yields valuable insights in the consequences of temporary employment on the employment career development that cannot be provided by transition-based approaches.

Building upon the work of Fuller and Stecy-Hildebrandt, we adopt a holistic career approach to study the quality of employment careers by using multichannel sequence analysis on labour market positions and incomes in the Netherlands. Using this method, the aforementioned four issues of previous research can be tackled. First, we take into account heterogeneity in temporary employment – more than previous research has done – by distinguishing between fixed-term contracts, temporary work agency jobs and on-call jobs. Secondly, sequence analysis allows us to study employment careers by taking into account the number and type of transitions that are made, the duration of every spell of employment contract and non-employment, as well as and the order in which these spells emerge in the career, rather than focusing on point-in-time transitions. Thirdly, permanent employment is not considered the only optimal outcome as we also take into account the income of the job and the possible labour market transitions that occur *after* the transition to a permanent contract. Finally, we simultaneously study the employment trajectories and the income of workers. This allows us to evaluate the quality of careers at the level of employment and income security (Bolhaar et al., 2016). In this way, we can better distinguish between successful and precarious employment careers and therefore get a detailed picture of the extent to which temporary employment is a stepping stone or a trap in the Dutch labour market.

### 3. Data and methodology

In this paper, we aim to create a typology of employment careers that resemble each other on the basis of labour market positions and income. Sequence analysis is a statistical method that is appropriate to fulfil the aforementioned aim as it allows us to study temporally ordered sets of events and to cluster them based on similarity. As we want to create a typology of temporary employment careers on the basis of two types of states, labour market position and income, we use multichannel sequence analysis (Cornwell, 2015; Gauthier et al., 2010).

Sequence analysis is a statistical method that aims primarily at describing a series of events or states. Specifically, it measures the similarity of different trajectories that are present in the data and, on the basis of this similarity, classifies trajectories into clusters. Contrary to other statistical methods that are used in life course research, such as event-history analysis, sequence analysis does not aim at detecting causal relationships (Abbott and Tsay, 2000). Some may consider this a strong disadvantage (Levine, 2000; Wu, 2000), which may account for the relatively limited number of applications of this method in social sciences. However, we concur with Abbott and Tsay (2000) who claim that description is a valuable but too often overlooked part of social science research. As sequence analysis shows, the various strings of events that occur give a more detailed picture of employment careers than more traditional methods such as transition tables, that only depict the situation on certain points in time, or Kaplan-Meier plots, that only show the cumulative occurrence of one specific event, such as the transition to permanent employment.<sup>2</sup>

Sequence analysis has its origin in genetics for the purpose of studying DNA sequences, but is increasingly being used in the social sciences for studying longitudinal phenomena, such as by Scherer (2001), Elzinga and Liefbroer (2007) and Aisenbrey and Fasang (2017). To our knowledge however, the only study that has applied sequence analysis to study temporary employment to date is Fuller and Stecy-Hildebrandt (2015).

The key concept in (multichannel) sequence analysis is the similarity of sequences. The most widely used method to determine this similarity is *Optimal Matching* (Abbott and Forrest, 1986; Abbott and Tsay, 2000). To determine the similarity of sequences, this method takes into account the number of substitutions and permutations that are needed to make two sequences identical. Each change (i.e. substitution or permutation) is assigned a cost according to the judgement of the researcher. Specifically, to make certain sequences more distant than others, one can decide to make certain changes more ‘expensive’ than others. However, Optimal Matching does not take into account the timing of transitions in the determination of similarity. This is an important disadvantage as timing is a very important aspect of careers, especially when studying labour market transitions: a career in which a transition to permanent employment occurs after six months differs considerably from a career in which that transition occurs after 60 months. Optimal matching is rather insensitive to such timing differences, as it allows for aligning sequences by inserting and deleting states (Studer and Ritschard, 2016). This could have as a consequence that such careers are classified as similar, while they substantively differ from each other. To make our analysis more sensitive to timing differences, we use a *Hamming distance* cost setting with constant substitution costs (Hamming, 1950). The Hamming distance does not allow for inserting and deleting states by assigning

<sup>2</sup> Sequence analysis can be part of a causal analysis, as the resulting typology resulting may be used as a dependent variable in order to predict which kind of factors lead to a certain type of sequence. In this paper, the focus lies on creating a typology of temporary employment trajectories itself that can be used in future research for causal analysis.



extremely high costs to such changes, which means that sequences can only be aligned by substituting states. This prevents important labour market transitions from being moved either forward or backward in time when determining the similarity of sequences. This means that timing is prioritized (Studer and Ritschard, 2016).<sup>3</sup>

In multichannel sequence analysis, two or more channels per individual are studied simultaneously. This means that the channels are linked, which in our case means that the labour market position of person 1 in time point 1 in the first channel occurs at the same time as the income of person 1 in time point 1 in the second channel. This multichannel nature complicates the determination of the similarity of sequences. Multichannel sequence similarity is determined following the approach of Pollock (2007). In this approach, the states of the two channels are first combined into a new sequence consisting of “multi-states”. In this approach, the states of the two channels (A and B) are first combined into a new sequence consisting of “multi-states”. In every time point the state of this new sequence is defined as the combination of the states of the two channels in the same time point (AB). Second, we proceed by determining the similarity of the new sequences. This is done by summing the substitution costs of the separate channels. For example, if the cost of moving from state  $A_1$  to state  $A_2$  is 1 and the cost of moving from state  $B_1$  to state  $B_2$  is 2 then, in the new sequence, the cost of replacing multi-state  $A_1B_1$  for multi-state  $A_2B_2$  is 3. The multichannel sequence analysis is conducted in the statistical software R (R Core Team, 2017) using the TraMineR package (Gabadinho et al., 2011) and the WeightedCluster package (Studer, 2013).

### 3.1. Data

The data that are used come from a dataset that was constructed by Statistics Netherlands with the specific purpose of studying the dynamics of temporary employment. This dataset is a subset of the basic integral registration dataset (*‘System of social statistical datasets’ – SSD*) that contains micro level register data on welfare, jobs and other characteristics for all individuals who are registered in the Netherlands. These data have been collected by Statistics Netherlands combining information from the basic integral registration (*‘Polisadministratie’*), from the Dutch tax administration (*‘Belastingdienst’*) and the Dutch Employee Insurance Agency (*‘UWV’*) (Bakker et al., 2014). The subset on temporary employment contains information about the labour market position of all individuals aged between 15 and 74 who have started working in temporary (dependent) employment as from January 2007 (de Vries et al., 2017). People who were already in temporary employment during the three months before January 2007 are not included in the dataset. For the purpose of this study, we retained individuals who entered temporary employment between January 1st 2007 and December 31st 2007. These individuals can be followed until December 2015, allowing us to study individuals for 96 months. The records contain exact information – including the start and end dates – on employment status, contract type and (un)employment spells. All records that were shorter than one month are merged into monthly observations, prioritizing the record with the longest duration, which results in a dataset with 96 monthly episodes for every person. Although the 8-year period does not cover complete employment careers, our data offer a highly detailed time window that can be studied holistically to represent the employment career. The dataset with employment careers is linked to income records collected by the Dutch tax office that are also available in the main dataset (SSD). These income records contain information on income from paid employment, self-employment as well as income from benefits.

Student jobs are filtered out by selecting individuals who were not enrolled in education at the moment they entered temporary employment. Also individuals aged under 18 (compulsory schooling age) at the moment of starting temporary employment are fully excluded from the sample. Individuals who receive old age pension benefits, a surviving dependant's pension or annuities for at least 12 months in the observation period are excluded from the sample. This selection mostly excluded older individuals who were close to the retirement age or who benefited from early retirement. Individuals aged over 60 at the moment of starting temporary employment are fully excluded from the sample. Finally, only individuals who could be observed for 96 months are included, which for instance excludes persons who emigrate or die. All the aforementioned selections resulted in a dataset consisting of 680,180 individuals. As we had insufficient computing power<sup>4</sup> at our disposal, we use a replication strategy using 6.5% random samples to come to a reliable typology. This replication strategy is discussed in section 3.3.

Since the dataset only includes individuals who have entered temporary employment in 2007, some issues of selectivity may arise in our study. First of all, we have no information about the career paths of individuals who never enter temporary employment. It is likely that the characteristics of these individuals differ from the characteristics of the individuals who do enter temporary employment. However, as we want to focus on the career after entering temporary employment, the group of individuals who never enter temporary employment is not relevant to our research. Second, we only observe careers from the moment the individual enters temporary employment. Unfortunately, we have no information on the employment history of individuals. This does not pose any problems for the creation of the typology, but may introduce some bias when further research attempts to predict cluster membership on the basis of our typology.

<sup>3</sup> The *Dynamic Hamming distance*, which is an extension of the Hamming distance that allows for time-varying costs based on transition rates, was considered for the analyses as well. However, as determining costs based on transition rates is disputed (Studer and Ritschard, 2016) and the final results did not substantively differ from the results obtained using the regular Hamming distance, the latter was used.

<sup>4</sup> Running an analysis on 680,180 sequences of length 96 would require an extremely powerful computer, as a matrix of 680,180 by 680,180 would have to be created.

### 3.2. Variables

The variables that are used to create the multichannel sequences are labour market position and income. The variable labour market position for the first channel is based upon two main variables: type of contract and socio-economic position in a given month. The type of contract distinguishes between permanent contracts, fixed-term contracts, temporary work agency contracts, on-call contracts and interns. However, as the number of interns was very small ( $< 0.5\%$ ) this group was merged with fixed-term contracts. Temporary work agency workers and on-call workers may be employed on a permanent contract. However, they are still classified in the respective categories of temporary employment as these workers, despite their permanent contracts, have insecurity in terms of the location of employment or working hours.

Within the group of individuals who were not in dependent employment, we distinguish between self-employed, unemployed, those on non-work related benefits, students, retired and a group of all other states. Individuals are considered self-employed only when their largest income source is self-employment. Unfortunately, we cannot observe people who combine dependent employment and self-employment.<sup>5</sup> Due to the restrictions that we applied, the number of individuals receiving a pension benefit was very small ( $< 0.5\%$ ). Therefore, this group is merged into the state 'other'. Actually, the state 'other' is very heterogeneous, as apart from those receiving a pension benefit, it also includes inactive individuals and individuals with an unclassified labour force status. In total, we distinguish between nine possible states for the labour market position in the sequence analysis (see Table 1).

The second channel of the sequence analysis is based on monthly individual income from the main job or, in case of non-employment, income from benefits. In both cases, this refers to gross income, excluding special payments and bonuses. For the self-employed, we rely on information about their yearly income, which they provide in their yearly earnings statements to the tax office. These incomes are divided by the number of months in self-employment in the year to get the monthly income from self-employment. The income of the self-employed includes also income from other activities, such as freelancing (19.9% of the records).<sup>6</sup>

As sequence analysis treats all states as discrete and computes costs for each state combination, it is not possible to include income as a continuous variable. Therefore, individual monthly income is classified into 13 categories (see Table 1). In this classification, we use a smaller range for lower income groups and a larger range for higher income groups. The reason for this choice is that an income fluctuation of €250 is likely to have larger consequences for persons receiving a lower income (e.g. €750) than for persons receiving a high income (e.g. €2500).<sup>7</sup> As career quality is not only influenced by income level but also by income stability, we want to allow for such fluctuations to affect the analysis.<sup>8</sup>

### 3.3. Clustering: a replication strategy

Sequences are clustered with a Ward clustering (Ward, 1963). However, determining the number of clusters was a complex matter. The existing objective measures for the determination of the optimal number of clusters are based on the homogeneity of sequences (Studer, 2013). In our data, there is considerable sequence heterogeneity: for example, within the 44,571 sequences of sample 1, 44,265 are unique. This is due to the large number of states in both channels and the sequence length. Therefore, in our case, the minimum cluster quality standards of these objective measures were never met, not even closely.

In cases where the objective measures of determining the optimal number of clusters are not applicable, a different approach needs to be developed. Therefore, we designed a replication strategy that can be used to deal with extremely heterogeneous sequences and get a reliable clustering solution. This strategy is inspired by the bootstrapping method proposed by Hennig (2007) but differs from it in two ways: first, whereas Hennig's method allows for sampling with replacement within the data that is used for the sequence analysis, our replication strategy draws a limited number of equally sized random samples without replacement from the population of 680,180 individuals. Second, our replication strategy does not rely on quantitative measures to determine cluster reliability, but focuses more on the similarity in the substantive interpretation of the clusters. This qualitative aspect of the method allows for dealing with heterogeneous sequences, as quantitative measures are of little use for such heterogeneous groups. However, this qualitative method involves a time consuming process as we have to provide a substantive interpretation to several clustering

<sup>5</sup> When an individual is in the payroll of a company, (s)he is always registered as an employee, even if (s)he is actual owner of the company.

<sup>6</sup> The measurement of the income of the self-employed is far from ideal for several reasons. First, monthly income for this group is an average coming from the yearly income and therefore it is far from an accurate approximation of the real monthly income from self-employment. Second, we do not observe capital income, which can be an important source of income for the self-employed. Furthermore, the self-employed may re-invest parts of their profits into their company. Finally, the self-employed may benefit from fiscal creativities to lower their incomes. Combined, these disadvantages are likely to lead to an underestimation of the incomes of the self-employed. Furthermore, we do not have information on the incomes of directors/large shareholders and family workers. Results concerning the self-employed should thus be interpreted with care.

<sup>7</sup> For reference, the modal monthly income in the Netherlands varied from €2400 in 2007 to €2700 in 2015.

<sup>8</sup> There are several other reasons why we have decided to use this number of income brackets. First of all, in contrast to what we would expect, reducing the number of income categories did not lead to a reduction of the final number of clusters in the typology. Second, if we would take larger income categories, such as income quintiles, not only would we miss substantive income fluctuations in the lower ends of the income spectrum, but the clusters of a resulting typology would be more homogeneous in terms of income than in terms of labour market positions, as it would become easier to align sequences based on income than on labour market positions. This would make it much harder to classify clusters in terms of employment security. Furthermore, as we strive to get an image of the extent to which temporary employment functions as a stepping stone or trap, we prefer to achieve more homogeneity based on labour market positions than on incomes. Though channel weights could be used for this purpose as well, we feel that the choice for any channel weights would be arbitrary, whereas our choice for the income categories is substantively founded.

**Table 1**  
Categories of sequence variables.

Labour market position	Gross monthly income (in €)
■ Permanent contract	■ No income
■ Unemployed	■ 1-250
■ Social benefit	■ 251-500
■ Student	■ 501-750
■ Other	■ 751-1000
■ Self-employment	■ 1001-1250
■ On-call work	■ 1251-1500
■ Temporary work agency employment	■ 1501-1750
■ Fixed-term contract	■ 1751-2000
	■ 2001-2500
	■ 2501-3000
	■ 3001-4000
	■ 4000+

solutions. Therefore, the replication strategy proposed here is preferable to Hennig's original bootstrapping method only when quantitative measures cannot be used and when computational limits prevent the use of large-scale data.

The aforementioned replication strategy was executed as follows. First, ten random non-overlapping 6.5% samples were drawn from the original population of 680,180 individuals. This was the largest sample size on which sequence analysis could be performed with the available computational power. This means that, in total, 442,882 individuals were included in the analysis. For each of these samples, cluster solutions up to 25 clusters were created. Previous explorative analyses indicated that this is the upper limit of the expected number of clusters. For each sample, every additional cluster was scrutinized based on whether it added substantive information to the typology, for instance by splitting up an existing cluster into two clusters with different career patterns or very different income levels. In terms of labour market positions, we valued substantive information about employment over information about non-employment. For example, a split between on-call workers and temporary work agency workers would be considered as substantive, whereas a split between late transitions to welfare and early transition to welfare would not be considered substantive. If an additional cluster did not add new substantive information to the typology, the cluster solution without that cluster was chosen as the optimal solution for that sample. The optimal cluster solutions for the ten samples were then compared, and the most frequent optimal number of clusters was determined. In our case, the optimal number of clusters turned out to be 17, which was the optimal solution in three of the ten samples. In other samples, the optimal number of clusters varied between 16 and 20 clusters.

Second, for the same ten samples, solutions with the optimal number of clusters (17) were created. With very heterogeneous sequences, it is unlikely that the outcomes of the 17-cluster solutions of the ten samples are identical. Therefore, the cluster solutions of the different samples were compared, and the occurrence of the various clusters was counted. Giving clusters short substantive descriptions, or *mottos*, simplified this process. The clustering solution of the first sample was consequently compared to the other samples. Every time a cluster was found to be substantively different from any of the clusters found in previous solutions, it was added to the list and was searched for in following sample solutions. The outcome of this process was a list of all the clusters that could be found in the population and the frequency in which these clusters occurred. In our data, 28 different clusters could be identified in the ten 17-cluster solutions. The final typology was then created by identifying the clusters that occur frequently, to make sure that their occurrence is not coincidental, and subsequently selecting a sample in which all these clusters were present. This ensures the reliability of the typology. In our data, 17 of the 28 clusters were present in at least five of the ten samples. Our final typology thus consists of 17 career types. Sample 1 contained all these most frequent clusters and can be regarded as the most representative sample for the full typology. The results of the replication strategy can be found in Table 2. The table shows the frequency of the clusters in the ten random samples and the sizes of the clusters in these samples. The lower part of the table furthermore displays which clusters were not included in the typology as they were only present in less than five of the samples. The resulting typology is discussed in the next section.

#### 4. Results

The typology is graphically illustrated using sorted index plots (Scherer, 2001) that are created using the most representative sample (sample 1). These plots of all 17 clusters are presented in the online appendix. In these plots, the different states are denoted using different colours. The x-axis indicates the position, in this case the time in months, while every point in the y-direction indicates an individual. Each cluster in the typology is given a *motto* that describes the careers within that cluster. These mottos are presented in Table 3, together with the mean size of the cluster in the 10 samples of the replication strategy, and some descriptive statistics on the main demographic characteristics of the clusters.

The two channels of the multichannel sequence analysis – labour market position and income – refer to two important aspects of employment career quality: employment security and income security. Grouping trajectories in a typology with a meaningful number of clusters offers us the opportunity of distinguishing the prosperous from the precarious clusters in terms of these two types of



**Table 2**  
Replication strategy: relative sizes of clusters occurring in the 17-cluster solutions per sample.

	Number of cases										Count
	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	
	44571	44106	44525	44373	44072	44405	44349	44296	43703	44655	
1	6.42%	5.28%	4.14%	3.78%	3.90%	5.93%	4.62%	5.83%	4.98%	5.71%	10
2	5.76%	6.47%	7.52%	5.54%	6.38%	6.20%	5.83%	5.15%	2.83%	5.38%	10
3	6.60%	5.59%	9.02%	7.36%	6.62%	6.65%	5.66%	6.81%	4.30%	5.93%	10
4	4.06%	6.94%	6.66%	4.53%	5.99%	6.58%	5.34%	6.01%	7.83%	6.57%	10
9	7.17%	6.76%	7.56%	7.22%	6.99%	7.44%	7.64%	7.71%	7.36%	7.60%	10
10	4.93%	8.83%	5.24%	6.99%	3.84%	7.99%	4.21%	6.18%	3.42%	6.31%	10
12	3.25%	3.08%	4.00%	1.46%	3.15%	2.02%	2.36%	2.79%	1.89%	2.24%	10
15	11.85%	11.36%	9.69%	10.82%	10.58%	7.67%	7.91%	10.87%	11.56%	10.96%	10
16	3.34%	3.47%	2.36%	4.51%	2.60%	2.52%	3.44%	4.09%	4.23%	4.83%	10
17	3.75%	4.13%	3.90%	3.43%	3.60%	3.65%	4.28%	3.41%	3.97%	4.15%	10
7	5.30%	5.91%	6.97%	7.05%	7.90%	4.84%	x	4.76%	4.67%	6.10%	9
14	6.26%	3.88%	3.51%	x	7.91%	7.60%	3.05%	6.90%	4.49%	x	8
11	11.57%	7.42%	13.66%	7.88%	x	x	9.89%	x	10.13%	8.98%	7
5	4.48%	x	3.86%	x	x	x	9.07%	6.02%	9.95%	4.82%	6
13	3.63%	5.39%	3.21%	x	3.96%	x	x	3.25%	4.64%	x	6
6	7.73%	8.94%	x	7.29%	5.55%	7.11%	x	x	x	x	5
8	3.91%	4.89%	x	x	6.67%	x	x	6.38%	6.19%	x	5
*	Carers with a short period of inactivity	x	1.66%	4.48%	x	x	3.11%	x	x	5.08%	4
*	Volatile careers with periods of temporary work agency employment	x	x	8.90%	x	8.15%	11.20%	x	x	6.71%	4
*	Mostly temporary contracts, income < €2000	x	x	x	11.25%	6.31%	x	8.79%	x	x	3
*	Quick transition to permanent employment, income €1750	x	x	4.23%	x	x	x	5.05%	x	4.26%	3
*	Mostly temporary contracts, income €3000 +	x	x	x	x	x	3.31%	x	x	4.35%	2
*	Later transition to permanent employment, income €1500-€2000	x	x	x	x	4.49%	x	x	x	x	2
*	Quick transition to permanent employment, income €2500-€3000	x	x	x	x	x	x	x	7.56%	x	2
*	Quick transition to permanent employment, income < €1500	x	x	x	x	x	9.06%	x	x	x	1
*	Passing permanency, incomes €3000	x	x	x	3.09%	x	x	x	x	x	1
*	Volatile careers with periods of inactivity	x	x	6.59%	x	x	x	x	x	x	1
*	Mostly temporary contracts, income €2500 +	x	x	x	x	4.86%	x	x	x	x	1

**Table 3**  
Cluster motto's and descriptive cluster characteristics.

Cluster motto	N of most representative sample	Mean size (%) over 10 samples <sup>a</sup>	Size (%) of most representative sample	Gender		Level of education			Ethnicity			Mean (SD) age	
				Male (%)	Female (%)	Education missing (%)	Low education (%)	Average education (%)	High education (%)	Native Dutch (%)	Western minority (%)		Non-western minority (%)
Total sample	44571	101.4	100.0	48.1	51.9	43.4	29.0	43.1	22.9	72.8	10.3	16.9	36.0 (10.08)
1. Comfortable Careers	2860	5.1	6.4	77.0	23.0	35.4	2.2	21.5	76.4	84.1	10.2	5.7	37.9 (9.30)
2. Prospects Pronto	2566	5.7	5.8	69.1	30.9	39.8	7.0	32.9	60.1	83.5	9.3	7.2	36.2 (8.72)
3. Swift Security	2943	6.5	6.6	60.1	39.9	42.2	13.2	47.1	39.7	81.2	8.6	10.1	34.4 (9.19)
4. Common Course	1811	6.1	4.1	51.4	45.9	48.4	22.2	52.1	25.7	79.3	9.4	11.2	34.7 (9.69)
5. Moderately to Modesty	1995	6.4	4.5	41.2	58.8	40.3	30.1	50.9	19.0	77.8	10.1	12.0	33.9 (9.31)
6. Regular Route	3445	7.3	7.7	21.0	79.0	49.8	29.6	50.3	20.1	79.6	8.5	11.9	36.9 (9.89)
7. Precarious Permanency	2362	6.0	5.3	11.6	88.4	53.9	42.1	45.8	12.1	79.2	8.5	12.4	39.5 (9.55)
8. Fortunate Fixed-term	1742	5.6	3.9	70.2	29.8	39.4	13.9	43.0	43.0	82.5	9.5	8.0	34.2 (9.04)
9. Shift to Self-employment	3196	7.4	7.2	55.3	44.7	44.0	21.2	41.8	37.0	74.3	9.7	16.0	36.4 (9.48)
10. Passing Permanency	2199	5.8	4.9	49.3	50.7	41.5	23.0	48.1	28.8	77.1	9.6	13.2	35.8 (9.83)
11. Forever Flexible	5158	9.9	11.6	42.2	57.8	37.6	31.6	50.1	18.3	74.4	9.5	16.1	35.3 (10.26)
12. Ongoing On-call	1447	2.6	3.9	24.7	75.3	51.9	38.8	48.3	12.9	76.8	9.2	14.0	37.9 (10.99)
13. Temporary Work Agency Track	1617	4.0	3.6	66.1	33.9	38.2	38.7	51.1	10.2	63.6	11.1	25.4	34.6 (10.30)
14. Inactive Intermezzo	2791	5.4	6.3	37.2	62.8	42.0	40.2	43.8	16.0	62.2	12.6	25.3	33.2 (10.72)
15. Way to Welfare	5281	10.3	11.9	55.0	45.0	42.0	55.4	36.9	7.7	56.7	10.3	33.0	36.7 (10.81)
16. Itinerary to Inactivity	1488	3.5	3.3	21.4	78.6	54.4	43.4	39.8	16.8	65.5	11.4	23.1	39.1 (11.11)
17. Unfortunate Unemployed	1670	3.8	3.8	57.4	42.6	53.0	33.5	39.4	27.1	42.6	23.1	34.3	36.0 (10.56)

<sup>a</sup> Because we look at the mean sizes of the clusters of the 10 samples, the total size does not add up to 100%.

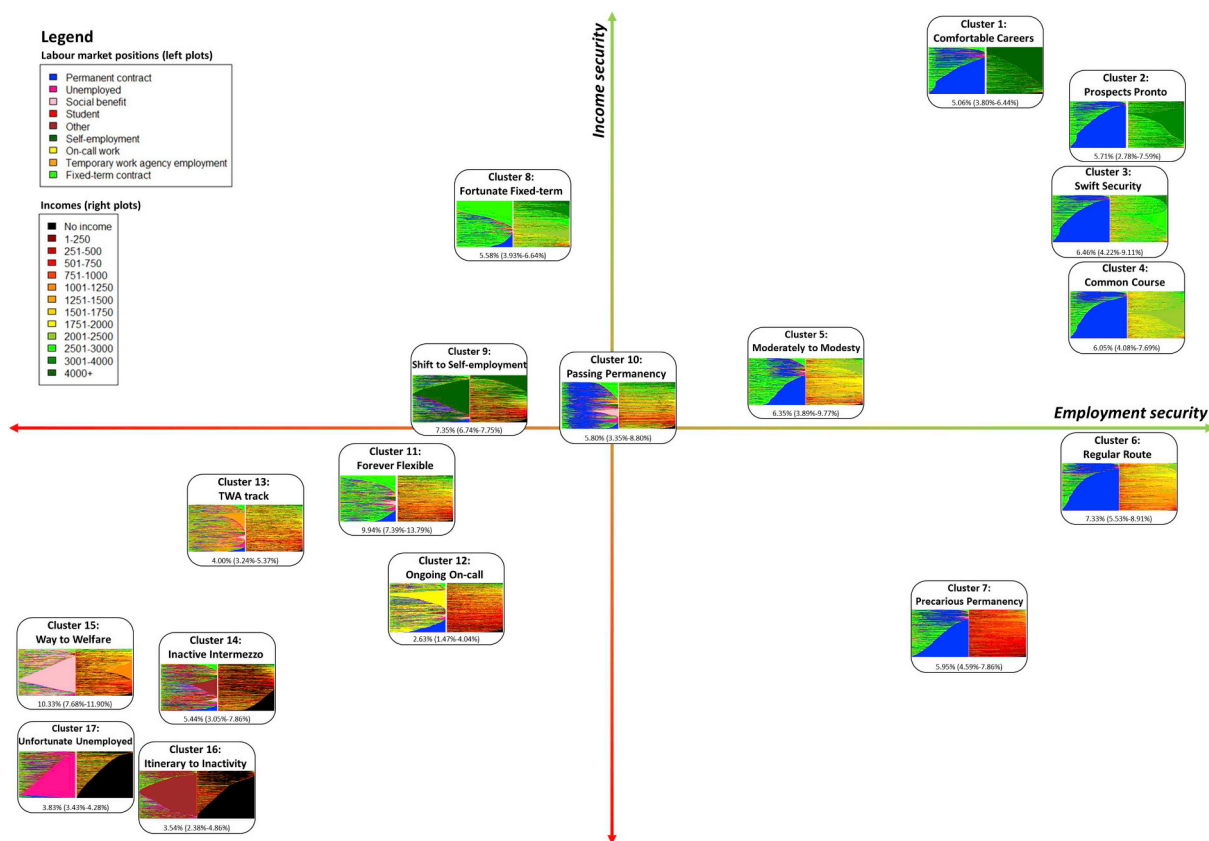


Fig. 1. The 17 clusters of employment careers located on a grid of employment security and income security.

security. Therefore, we position the clusters on a grid with two dimensions: employment security and income security. This grid is depicted in Fig. 1. We use several indicators to assess the employment and income security of the careers. A discussion on the validity and the exact values of these indicative measures per cluster can be found in the online appendix. In this grid, employment security is indicated by 1) the mean percentage of individuals in the cluster that are employed throughout the observation period, 2) the mean duration until a transition to permanent employment in the cluster, based on Kaplan-Meier estimates, 3) the mean number of employer changes that individuals in the cluster experience within the observation period, and 4) the contract types encountered in the cluster. For instance, a career in which workers make the transition from fixed-term employment to permanent employment and remain in permanent employment has more employment security than a career in which workers alternate frequently between different types of temporary employment or unemployment. Income security is indicated by 1) the mean average income earned by individuals in the cluster during their careers and 2) the mean standard deviation of income individuals earned during their careers.

In every cluster that appears in the grid, sequences of labour market positions are always placed in the left plot, while income sequences are displayed in the right plot. In what follows, we discuss the typology per quadrant of the grid of Fig. 1. We also briefly discuss some of the demographic characteristics of the clusters in the quadrants. As these figures are only based on descriptive statistics, we defer from making any causal inference. For more detailed information on the clusters, we refer to the online appendix.

In the top right quadrant of the grid, we find the careers that are characterized by high levels of both employment security and income security. Individuals in these clusters make the transition to permanent employment on average after around 17–22 months, which is in most cases the final transition within the observation period. Only the cluster *Moderately to Modesty* deviates from this pattern as, in this cluster, it takes workers in this cluster approximately three years to enter permanent employment. Contrary to labour market positions and contract types, incomes in this quadrant vary somehow between clusters. Individuals in *Comfortable Careers* are the most well-off, as most of them earn monthly wages of at least €4000, followed by individuals in *Prospects Pronto*, whose wages grow to around €3000 within the observation period. In this quadrant, the wages are lowest – around €1700 – in *Moderately to Modesty*. However, incomes in this cluster tend to increase over time. Overall, this quadrant consists of career types of individuals who fare well since temporary employment functioned as a stepping stone for them. In total, 29.6% of the individuals are in clusters that mainly consist of stepping stone careers. Descriptive statistics of the clusters in this quadrant show that higher educated native Dutch men tend to be overrepresented in this quadrant, especially in clusters with higher income levels. For example, in the cluster of *Comfortable Careers*, 77% of the individuals are male and 76.4% are higher educated.

The bottom right quadrant of the grid includes the clusters that are characterized by high employment security but low income security, that together contain 13.3% of the total sample: *Regular Route* and *Precarious Permanency*. Individuals in *Precarious*

*Permanency* make the transition to permanent employment after around two years, just like the individuals in the top right quadrant. However, these individuals earn wages of around €750 monthly on average. In *Regular Route*, individuals make the transition to permanent employment after around 17 months on average. The incomes in this cluster are quite heterogeneous, but on average individuals earn a modest €1500, while only few earn more than €2000 monthly. Previous research would have classified the careers in these clusters as stepping stones based on their employment security. However, the low income security in this quadrant makes these careers much more precarious and deter us from classifying them as stepping stones. Descriptive statistics indicate that women are highly overrepresented in this quadrant (79% in *Regular Route* and 88.4% in *Precarious Permanency*). Furthermore, lower educated individuals are overrepresented in *Precarious Permanency* (42.1%). This cluster also has the highest average age (39.5 years). The overrepresentation of women in this quadrant is due to the fact that a large share of Dutch women works part-time, which has as a consequence that they have lower monthly incomes. In many cases, these women can also rely on their partner's income. The actual precarity of these individuals may thus be overestimated. However, with such incomes, these individuals are not economically independent. In the case that the partner's income is discontinued for whatever reason, the individual remains in a precarious situation.

In the bottom left quadrant we find the clusters with careers that have both relatively low employment security and low income security. These careers would fit the classical trap image as it consists of the more precarious groups in the labour market, which sum up to 39.7% of the individuals. Such careers are very common in the clusters *Way to Welfare* and *Unfortunate Unemployed*, that consist of careers characterized by transitions to welfare benefits or unemployment respectively, and in *Itinerary to Inactivity* and *Inactive Intermezzo*, in which individuals permanently or temporarily leave the labour market either. Descriptive statistics show that women are overrepresented in *Itinerary to Inactivity* (78.6%) and *Inactive Intermezzo* (62.8%), while males are overrepresented in *Way to Welfare* (55.0%) and *Unfortunate Unemployed* (57.4%). For all four clusters holds that native Dutch individuals are underrepresented (especially in *Unfortunate Unemployed*, where 57.4% of the individuals are non-Dutch) while lower educated individuals are overrepresented. *Unfortunate Unemployed* however also has a relatively high share of higher educated individuals (27.1%). Interestingly, individuals in *Itinerary to Inactivity* are on average quite old (mean age 39.1) while individuals in *Inactive Intermezzo* are on average youngest of all clusters (mean age 33.2).

Nevertheless, in the same quadrant, we also find careers in which individuals mostly are employed, but still lack both income and employment security. Individuals in the clusters *On-going On-call* and *Temporary Work Agency Track* have careers that consist mostly of the type of temporary employment that is indicated in the cluster mottos, which in general offer less security than fixed-term contracts. Unsurprisingly, most careers in the *Temporary Work Agency Track* are characterized by frequent job changes and a relatively low percentage of time spent in employment. This is also the case, but to a lesser extent, for the cluster *Ongoing On-call*, which indicates that the individuals in this cluster have more employment security than the individuals in the *Temporary Work Agency Track*. Furthermore, wages in these two clusters are relatively low and rarely exceed €1500 monthly - with the exception of a few individuals in the *Temporary Work Agency Track*. Also, given the frequent changes within income sequences and the relatively high standard deviations of individuals' incomes (see online appendix), incomes in these clusters fluctuate more than in the other quadrants. This is a clear indication of low income security. Descriptive statistics indicate that lower educated individuals are overrepresented in both these clusters (38.8% in *Ongoing On-call* and 38.7% in *Temporary Work Agency Track*). In *Ongoing On-call*, native Dutch and women are overrepresented (76.8% and 75.3%, respectively), while in the *Temporary Work Agency Track*, most of the individuals are male and relatively many have a non-western migration background (66.1% and 25.4%, respectively).

This bottom left quadrant further contains the cluster *Forever Flexible* with careers in which individuals remain in fixed-term employment for most of the observation period. The individuals in this cluster have relatively stable careers in fixed-term jobs, which make them score higher in employment security compared to the individuals in the *Temporary Work Agency Track*, but they spend less time in employment than workers in *Ongoing On-call*. Their wages are generally low, approximately €1500 monthly on average. Descriptive statistics show that a small majority of the individuals in this cluster is female (57.8%) and that there are relatively more individuals than average with an average level of education (50.1%).

Nonetheless, not all individuals who have careers that consist mostly of fixed-term employment should be called precarious. The cluster *Fortunate Fixed-term*, that contains 5.6% of the sample, is situated in the upper left quadrant of the grid as it mostly contains sequences with a lengthy stay in fixed-term jobs, but also high (between €2000 to more than €4000) and increasing wages. Some individuals of this cluster enter permanent employment after some time, but return to fixed-term employment later on. Such relapses are mostly not accompanied by income decreases, which probably indicates that these transitions are voluntary. Thus, though these careers would fit the traditional trap-image of repeated temporary jobs, the high incomes in this cluster allow these careers to be labelled prosperous, rather than precarious. 70.2% of the individuals in this cluster are male and 43% are higher educated. Native Dutch individuals are furthermore overrepresented in this cluster (82.5%).

On the x-axis between the upper and lower left quadrants, we also find a cluster that mostly contains careers that lead to self-employment, *Shift to Self-employment*, that contains 7.4% of the sample. In general, self-employment scores lower on employment security than regular fixed-term employment or permanent employment, as future employment depends solely on the efforts of the self-employed to find new clients. The incomes in this cluster also vary considerably: there are some self-employed individuals who see their incomes increase to over €4000 monthly, whereas also many individuals earn very low incomes. Therefore, this cluster is placed on the border of the two quadrants, as some fare well, but others are stuck in precarity. Descriptive statistics show that this cluster contains slightly more men than women (55.3%) and relatively many higher educated individuals (37%).

Finally, there is one cluster that holds a middle position in the grid: *Passing Permanency*. This group represents 5.8% of the sample. Careers in this cluster are characterized by a high level of heterogeneity in both labour market position and income. Employment sequences are very volatile and usually include a return to fixed-term employment. Individuals mostly start in fixed-term employment

and enter permanent employment after around one year. For this reason, previous research would have classified these careers as stepping stones. However, after around four years in permanent employment, a large share of the individuals returns to fixed-term employment, either directly or through a period of unemployment. For some, this fixed-term job is followed by a new permanent job, for some by unemployment, while for others fixed-term employment persists. Incomes in this cluster are quite heterogeneous. Many individuals see their incomes increase throughout the observation period, while others experience income decreases. This cluster clearly shows that permanent employment is not necessarily the final outcome of a career, and that the quality of the career should not be determined based upon that one specific transition (i.e. to permanent employment). According to descriptive statistics, individuals in this cluster are slightly higher educated than average (28.8%), but the gender distribution is almost perfectly balanced.

The typology shows that there is considerable variation in temporary employment careers. We can conclude that 29.6% of the workers has a typical stepping stone career while 39.7% has a career that can be classified as a trap. Most important however is the fact that not all careers fit in the original stepping stone and trap dichotomy. 13.3% of the individuals combine high employment security with low income security, making their careers, which would usually be classified as successful, much more precarious. 5.6% of the individuals combine low employment security with high income security, making their careers, which would usually be classified as traps, much less precarious. Finally, 5.8% have careers in which the permanent job did not turn out to be the final outcome, making their careers, which would usually be classified as stepping stones, much less stable. Combined, these groups make up 24.7% of the sample. This means that almost a quarter of careers would have been misclassified in previous research.

## 5. Conclusion and discussion

The aim of this paper was to provide a detailed picture of employment and income careers using a holistic approach. For this purpose, a multichannel sequence analysis with labour market position and income as factors was used to study the careers of individuals in the Netherlands who started a job with a temporary employment contract in 2007. The multichannel sequence analysis was complemented by a replication strategy to ensure the reliability of the results. This analysis resulted in a typology of 17 types of temporary employment careers that partly deviate from the ‘traditional’ division between stepping stone and trap careers that is dominant in previous literature.

Three important conclusions can be drawn from this analysis. The first is that a career that involves working with a temporary employment contract is not always precarious, as is often assumed by labour market segmentation theories. Actually, the type of temporary employment is crucial in determining whether the career is precarious or not. Working for temporary employment agencies or on an on-call contract leads to low levels of both career and income security. In contrast, working with a fixed-term contract may lead to several outcomes: either low or high employment security combined with again low or high income security.

The second conclusion is that employment with a permanent contract is not necessarily a good nor a final outcome, as previous research suggests. Many individuals who enter permanent employment relatively quickly still earn relatively low wages (13.3% of the sample). The same low wages are also observed for other individuals that have to wait long before they can enter permanent employment. These findings make it questionable whether the permanency of the job can uniformly define a good career outcome. Furthermore, for a fair amount of individuals (5.8% of the sample), employment with a permanent contract is not the final outcome in their career as they return to temporary employment. For some, this seems to be a voluntary choice, as this transition is accompanied by wage increases. For others this transition is most probably involuntary as it is accompanied by a period of unemployment.

The last and most important conclusion of this paper is that making the distinction between traps and stepping stones only does not fully render justice to the large variety in temporary employment trajectories that is observed in the Dutch labour market: although 29.6% of the careers can be classified as stepping stones and 39.7% as traps, about a quarter (24.7%) of the individuals follow a career that does not fit into the original trap and stepping stone scenarios, because they combine high income security with low employment security or vice versa, or because the permanent contract was not the final outcome in the career. This diversity should be taken into account when studying temporary employment and its outcomes and when formulating policies, as these groups are otherwise neglected. For policy makers, it could be an option to change the focus from specific policies that aim at improving the position of workers holding particular contract types to policies that strive to improve the working conditions of all the more precarious individuals, regardless of their contract type.

This paper corroborates the claim of recent previous research – most importantly [Fuller and Stecy-Hildebrandt \(2015\)](#) – that a holistic approach such as sequence analysis gives more detailed insights into the labour market than an analysis of point-in-time transitions. Analysing employment careers with sequence analysis allows us to study the quality of employment careers by studying several aspects of job quality simultaneously (here: labour market positions and income), and to take into account the considerable heterogeneity of the types of temporary employment, while it does not assume permanent employment to be the only good outcome.

This paper contributes as well to our overall understanding of the role of temporary employment in shaping social inequality. Segmentation theorists often see temporary employment as a source of inequality and typically proxy the secondary segment of the labour market by employment with temporary contracts. Our analysis shows that reality in the labour market is much more complex than the division between jobs with permanent contracts in a specific firm and with fixed working hours and jobs with fixed-term contract and/or variable hours in different firms. Except for the obvious inequality that exists between different income levels and that can be clearly attributed to some employment contract types, such as temporary agency contracts and on-call contracts, there is a lot more inequality to explain within careers with fixed-term contracts.

Though we have shown that sequence analysis is a useful tool for understanding labour market inequalities, this study also suffers from some limitations. The first is that we make statements about the quality of careers based on labour market positions and incomes



only. Though we clearly go a step further than most previous research, subjective aspects of job quality, such as job satisfaction, should be taken into account as well (Kalleberg, 2011). Register data such as we used for this study are unable to capture these aspects. Second, we can only draw conclusions about the specific subgroup of persons who have entered temporary employment in 2007. We cannot make any claims about the extent to which the trajectories of this group differ from the trajectories of individuals who have never entered temporary employment. Finally, we are limited in our possibility to draw conclusions about the self-employed, both because we have limited information about their incomes, making it likely that their incomes are underestimated, and because we do not distinguish cases where individuals combine self-employment with dependent employment.

Explaining inequality in the labour market is the step that naturally follows from this paper. The career clusters may vary in their composition according to demographic or human capital factors such as gender, education, occupation and training opportunities. In our register data, there was only limited information available about the background characteristics of individuals. Linking register data with survey data, which is an increasingly used practice of Statistical Offices, may provide more detailed data on background characteristics is available. These data allow for a detailed causal analysis and can be a fruitful source subject for further research.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ssresearch.2018.10.001>.

## References

- Abbott, A., Forrest, J., 1986. Optimal matching methods for historical sequences. *J. Interdiscipl. Hist.* 16 (3), 471–494.
- Abbott, A., Tsay, A., 2000. Sequence analysis and optimal matching methods in sociology. *Socio. Methods Res.* 29 (1), 3–33.
- Addison, J.T., Cotti, C.D., Surfield, C.J., 2015. Atypical jobs: stepping stones or dead ends? Evidence from the NLSY79. *Manchester School* 83 (1), 17–55. <https://doi.org/10.1111/manc.12052>.
- Aisenbrey, S., Fasang, A., 2017. The interplay of work and family trajectories over the life course: Germany and the United States in comparison. *Am. J. Sociol.* 122 (5), 1448–1484. <https://doi.org/10.1086/691128>.
- Atkinson, J., 1984. *Flexibility, Uncertainty and Manpower Management*. Institute for Employment Studies, Brighton.
- Autor, D.H., Houseman, S.N., 2010. Do temporary-help jobs improve labor market outcomes for low-skilled workers? Evidence from “work first.”. *Am. Econ. J. Appl. Econ.* 2 (3), 96–128.
- Bakker, B.F.M., Van Rooijen, J., Van Toor, L., 2014. The System of social statistical datasets of Statistics Netherlands: an integral approach to the production of register-based social statistics. *Stat. J. IAOS* 30, 411–424. <https://doi.org/10.3233/SJI-140803>.
- Becker, G.S., 1993. *Human Capital*, third ed. The University of Chicago Press, Chicago.
- Berglund, T., Hakansson, K., Isidorsson, T., Alfonsson, J., 2017. Temporary employment and the future labor market status. *Nordic J. Work. Life Stud.* 7 (2), 27–48. <https://doi.org/10.18291/njwls.v7i2.81523>.
- Berton, F., Devicienti, F., Pacelli, L., 2011. Are temporary jobs a port of entry into permanent employment? Evidence from matched employer-employee. *Int. J. Manpow.* 32 (8), 879–899. <https://doi.org/10.1108/01437721111181651>.
- Bolhaar, J., Brouwers, A., Scheer, B., 2016. De flexibele schil van de Nederlandse arbeidsmarkt: een analyse op basis van microdata. The Netherlands Institute for Economic Policy Research, The Hague Retrieved from. <https://www.cpb.nl/publicatie/de-flexibele-schil-van-de-nederlandse-arbeidsmarkt-een-analyse-op-basis-van-microdata>.
- Booth, A.L., Fancesconi, M., Frank, J., 2002. Temporary jobs: stepping stones or dead ends? *Econ. J.* 112 (189–213), 189–213.
- CBS Statline, 2018a. Labour participation; key figures. Retrieved June 5, 2018, from. <https://opendata.cbs.nl/statline/#/CBS/en/dataset/82309ENG/table?ts=1516876451799>.
- CBS Statline, 2018b. Werkzame beroepsbevolking; meer of minder willen werken. Retrieved June 6, 2018, from. <https://opendata.cbs.nl/#/CBS/nl/dataset/82917NED/table?ts=1528270287193>.
- CBS Statline, 2018c. Werkzame beroepsbevolking; positie in de werkkring. Retrieved September 26, 2018, from. <https://opendata.cbs.nl/#/CBS/nl/dataset/82646NED/table?ts=1537956610234>.
- Cornwell, B., 2015. *Social Sequence Analysis: Methods and Applications*. Cambridge University Press, New York.
- D'Addio, A.C., Rosholm, M., 2005. Exits from temporary jobs in Europe: a competing risks analysis. *Lab. Econ.* 12 (4), 449–468. <https://doi.org/10.1016/j.labeco.2005.05.002>.
- de Beer, P., 2016. Drijfvele krachten achter flexibilisering. In: de Beer, P. (Ed.), *Onzeker Werk. De Burcht*, Amsterdam, pp. 9–24.
- de Beer, P., Dekker, R., Olsthoorn, M., 2011. *Flexibilisering: De Balans Opgemaakt*. Wetenschappelijk Bureau voor de Vakbeweging, Amsterdam.
- de Graaf-Zijl, M., van den Berg, G.J., Heyma, A., 2011. Stepping stones for the unemployed: the effect of temporary jobs on the duration until (regular) work. *J. Popul. Econ.* 24 (1), 107–139. <https://doi.org/10.1007/s00148-009-0287-y>.
- de Lange, M., Gesthuizen, M., Wolbers, M.H.J., 2013. Consequences of flexible employment at labour market entry for early career development in The Netherlands. *Econ. Ind. Democr.* 35 (3), 413–434. <https://doi.org/10.1177/0143831X13485878>.
- de Vries, J., Michiels, J., Gringhuis, G., 2017. Verblifsduur in de flexibele schil naar regio. In: *Dynamiek op de Nederlandse arbeidsmarkt*. Statistics Netherlands, The

- Hague, pp. 50–69.
- Doeringer, P.B., Piore, M.J., 1971. *Internal Labor Markets and Manpower Analysis*. Heat, Lexington, Mass.
- Elzinga, C.H., Liefbroer, A.C., 2007. De-standardization of family-life trajectories of young adults: a cross-national comparison using sequence analysis. *Eur. J. Popul.* 23, 225–250. <https://doi.org/10.1007/s10680-007-9133-7>.
- Esteban-Pretel, J., Nakajima, R., Tanaka, R., 2011. Are contingent jobs dead ends or stepping stones to regular jobs? Evidence from a structural estimation. *Lab. Econ.* 18 (4), 513–526. <https://doi.org/10.1016/j.labeco.2010.12.010>.
- Eurostat, 2018a. Involuntary Part-time Employment as Percentage of the Total Part-time Employment, by Sex and Age (%).
- Eurostat, 2018b. Part-time Employment and Temporary Contracts - Annual Data.
- Eurostat, 2018c. Temporary Employees as Percentage of the Total Number of Employees, by Sex, Age and Citizenship (%).
- Euwals, R., de Graaf-Zijl, M., Van Vuuren, D., 2016. Flexibiliteit op de arbeidsmarkt: policy brief. The Netherlands institute for Economic Policy Analysis, The Hague.
- Faccini, R., 2014. Reassessing labour market reforms: temporary contracts as a screening device. *Econ. J.* 124 (575), 167–200. <https://doi.org/10.1111/ecoj.12072>.
- Fuller, S., Stecy-Hildebrandt, N., 2015. Career pathways for temporary workers: exploring heterogeneous mobility dynamics with sequence analysis. *Soc. Sci. Res.* 50, 76–99. <https://doi.org/10.1016/j.ssresearch.2014.11.003>.
- Gabadinho, A., Ritschard, G., Studer, M., Nicolas, S.M., 2011. *Mining Sequence Data in R with the TraMineR Package: a User's Guide for Version 1.8*. University of Geneva, Geneva.
- Gash, V., 2008. Bridge or trap? Temporary workers' transitions to unemployment and to the standard employment contract. *Eur. Socio Rev.* 24 (5), 651–668. <https://doi.org/10.1093/esr/jcn027>.
- Gash, V., McGinnity, F., 2007. Fixed-term contracts—the new European inequality? Comparing men and women in West Germany and France. *Soc. Econ. Rev.* 5 (3), 467–496. <https://doi.org/10.1093/ser/mwl020>.
- Gauthier, J.-A., Widmer, E.D., Bucher, P., Notredame, C., 2010. Multichannel sequence analysis applied to social science data. *Socio. Methodol.* 40 (1), 1–38. <https://doi.org/10.1111/j.1467-9531.2010.01227.x>.
- Giesecke, J., Groß, M., 2003. Temporary employment: chance or risk? *Eur. Socio Rev.* 19 (2), 161–177. <https://doi.org/10.1093/esr/19.2.161>.
- Hamming, R.W., 1950. Error detecting and error correcting codes. *Bell Syst. Tech. J.* 29 (2), 147–160. <https://doi.org/10.1002/j.1538-7305.1950.tb00463.x>.
- Hennig, C., 2007. Cluster-wise assessment of cluster stability. *Comput. Stat. Data Anal.* 52 (1), 258–271. <https://doi.org/10.1016/j.csda.2006.11.025>.
- Hevenstone, D., 2010. National context and atypical employment. *Int. Sociol.* 25 (3), 315–347. <https://doi.org/10.1177/0268580909360296>.
- Hopp, C., Minten, A., Toporova, N., 2016. Signaling, selection and transition: empirical evidence on stepping-stones and vicious cycles in temporary agency work. *Int. J. Hum. Resour. Manag.* 27 (5), 527–547. <https://doi.org/10.1080/09585192.2015.1020444>.
- Hudson, K., 2007. The new labor market segmentation: labor market dualism in the new economy. *Soc. Sci. Res.* 36 (1), 286–312. <https://doi.org/10.1016/j.ssresearch.2005.11.005>.
- Hunter, L., McGregor, A., MacInnes, J., Sproull, A., 1993. The 'flexible firm': strategy and segmentation. *Br. J. Ind. Relat* 31 (3), 383–407. <https://doi.org/10.1111/j.1467-8543.1993.tb00404.x>.
- Ichino, A., Mealli, F., Nannicini, T., 2008. From temporary help jobs to permanent employment: what can we learning from matching estimators and their sensitivity? *J. Appl. Econ.* 23, 305–327. <https://doi.org/10.1002/jae>.
- Kalleberg, A.L., 2001. Organizing flexibility: the flexible firm in a new century. *Br. J. Ind. Relat* 39 (4), 479–504. <https://doi.org/10.1111/1467-8543.00211>.
- Kalleberg, A.L., 2003. Flexible firms and labor market segmentation: effects of workplace restructuring on jobs and workers. *Work Occup.* 30 (2), 154–175. <https://doi.org/10.1177/0730888403251683>.
- Kalleberg, A.L., 2011. *Good Jobs, Bad Jobs*. Russell Sage Foundation, New York.
- Leschke, J., 2009. The segmentation potential of non-standard employment. *Int. J. Manpow.* 30 (7), 692–715. <https://doi.org/10.1108/01437720910997353>.
- Levine, J.H., 2000. But what have you done for us lately? *Socio. Methods Res.* 29 (1), 34–40. <https://doi.org/10.1177/0049124100029001002>.
- McGinnity, F., Mertens, A., Gundert, S., 2005. A bad start? Fixed-term contracts and the transition from education to work in West Germany. *Eur. Socio Rev.* 21 (4), 359–374. <https://doi.org/10.1093/esr/jci025>.
- Mincer, J., 1974. *Schooling, Experience, and Earnings*. Columbia University Press, New York.
- Mooi-Reci, I., Dekker, R., 2015. Fixed-term contracts: short-term Blessings or long-term scars? Empirical findings from The Netherlands 1980–2000. *Br. J. Ind. Relat* 53 (1), 112–135. <https://doi.org/10.1111/bjir.12024>.
- OECD, 2013. Detailed Description of Employment Protection Legislation, 2012–2013. OECD Publishing Retrieved from. <https://www.oecd.org/els/emp/All.pdf>.
- OECD, 2014. OECD Employment Outlook 2014. OECD Publishing. [https://doi.org/10.1787/empl\\_outlook-2014-en](https://doi.org/10.1787/empl_outlook-2014-en).
- Pavlopoulos, D., 2013. Starting your career with a fixed-term job: stepping-stone or “dead end”? *Rev. Soc. Econ.* 71 (4), 474–501. <https://doi.org/10.1080/00346764.2013.799970>.
- Picchio, M., 2008. Temporary contracts and transitions to stable jobs in Italy. *Lab. Travail* 22 (Special Issue), 147–174. <https://doi.org/10.1111/j.1467-9914.2008.00415.x>.
- Pollock, G., 2007. Holistic trajectories: a study of combined employment, housing and family careers by using multiple-sequence analysis. *J. Roy. Stat. Soc. Stat. Soc.* 170 (1), 167–183. <https://doi.org/10.1111/j.1467-985X.2006.00450.x>.
- Portegijs, W., Keuzenkamp, S., 2008. *Nederland deeltijdland: Vrouwen en deeltijdwerk*. The Netherlands Institute for Social Research, The Hague Retrieved from. [http://www.scp.nl/english/Publications/Summaries\\_by\\_year/Summaries\\_2008/Part\\_time\\_working\\_in\\_the\\_Netherlands](http://www.scp.nl/english/Publications/Summaries_by_year/Summaries_2008/Part_time_working_in_the_Netherlands).
- R Core Team, 2017. R: a Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna Retrieved from. <https://www.r-project.org>.
- Reichelt, M., 2015. Career progression from temporary employment: how Bridge and trap functions differ by task complexity. *Eur. Socio Rev.* 31 (5), 558–572. <https://doi.org/10.1093/esr/jcv055>.
- Remery, C., van Doorne-Huiskes, A., Schippers, J., 2002. Labour market flexibility in The Netherlands: looking for winners and losers. *Work. Employ. Soc.* 16 (3), 477–495. <https://doi.org/10.1080/0803973233>.
- Scherer, S., 2001. Early career patterns: a comparison of great Britain and west Germany. *Eur. Socio Rev.* 17 (2), 119–144. <https://doi.org/10.1093/esr/17.2.119>.
- Scherer, S., 2004. Stepping-stones or traps? The consequences of labour market entry positions on future careers in West Germany, Great Britain and Italy. *Work. Employ. Soc.* 18 (2), 369–394. <https://doi.org/10.1177/09500172004042774>.
- Smith, V., 1997. New forms of work organization. *Annu. Rev. Sociol.* 23 (1), 315–339. <https://doi.org/10.1146/annurev.soc.23.1.315>.
- Spence, M., 1973. Job market signaling. *Q. J. Econ.* 87 (3), 355–374. <https://doi.org/10.2307/1882010>.
- Steijn, B., Need, A., Gesthuizen, M., 2006. Well begun, half done?: Long-term effects of labour market entry in The Netherlands, 1950–2000. *Work. Employ. Soc.* 20 (3), 453–472. <https://doi.org/10.1177/0950017006066996>.
- Studer, M., 2013. *WeightedCluster library manual* (LIVES working papers No. 24). LIVES Working papers 24. <https://doi.org/10.12682/lives.2296-1658>. 2013.24.
- Studer, M., Ritschard, G., 2016. What matters in differences between life trajectories: a comparative review of sequence dissimilarity measures. *J. Roy. Stat. Soc. Stat. Soc.* 179 (2), 481–511. <https://doi.org/10.1111/rssa.12125>.
- Thiede, B.C., Lichter, D.T., Sanders, S.R., 2015. *America's working poor: conceptualization, measurement, and new estimates*. *Work Occup.* 24 (3), 267–312.
- Tilly, C., Tilly, C., 1998. *Work under Capitalism*. Westview Press, Oxford.
- van der Klein, M., Aussems, C., Jansma, A., de Gruitjer, M., Piets, K., 2016. *Een Nieuwe Generatie Een Nieuw Geluid?* Verwey-Jonker Instituut, Utrecht.
- van Echtelt, P., Schellingerhout, R., de Voogd-Hamelink, M., 2015. *Vraag Naar Arbeid 2015*. The Netherlands Institute for Social Research, The Hague.
- Vermeulen, H., de Wit, W., van Leest, B., Rossen, L., 2016. *Uitzendmonitor 2016*. KBA, Nijmegen.
- Ward, J.H., 1963. Hierarchical grouping to optimize an objective function. *J. Am. Stat. Assoc.* 58 (301), 236–244.
- Weiss, A., 1995. Human capital vs. signalling explanations of wages. *J. Econ. Perspect.* 9 (4), 133–154.
- Wolbers, M.H.J., 2010. Blijvende gevolgen van een gebrekkige start? *Tijdschr. Arb.* 26 (2), 223–239. Retrieved from. <http://www.socsci.ru.nl/~maartenw/ta-2010-2-wolbers.pdf>.
- Wu, L., 2000. Some comments on “sequence analysis and optimal matching methods in sociology: review and prospect.”. *Socio. Methods Res.* 29 (I), 41–64. <https://doi.org/10.1177/0049124100029001003>.